WHAT IS CLAIMED IS:

1. A method for providing a common coordinate basis between two optical wireless units wherein information is transmitted between the optical wireless units via light beams, the method comprising:

at the first optical wireless unit, moving the light beam in a prespecified pattern;

at the second optical wireless unit:

determining reference positions;

determining a basis for the plurality of optical detectors;

sensing the light beam using a plurality of optical detectors;

calculating measured positional data based on the sensed light beam;

calculating a set of coefficients using the basis and measured positional data; and

transforming positional data measured at the second optical wireless unit with the coefficients prior to transmitting the positional data to the first optical wireless unit.

2. The method of claim 1, wherein the plurality of optical detectors are arranged in a pattern around a data detector.

3. The method of claim 2, wherein there are four optical detectors that are equidistant from the data detector and equidistant from one another.

4. The method of claim 2, wherein there are three optical detectors that are equidistant from the data detector and equidistant from one another.

5. The method of claim 1, wherein there are a plurality of reference positions, the first determining step comprising the step of calculating the reference positions from a starting time for when the first optical wireless unit begins moving the light beam in the prespecified pattern and a prespecified sampling rate.

6. The method of claim 1, wherein there are a plurality of reference positions, the first determining step comprising the step of receiving a list of reference positions from the first optical wireless unit.

7. The method of claim 1, wherein there is a plurality of reference positions and the light beam is sensed for each reference position.

8. The method of claim 1, wherein the basis is a linear independent basis.

9. The method of claim 8, wherein the basis is an orthogonal basis.

10. The method of claim 9, wherein there are four optical detectors and the basis is defined as:

$$pn = (NE - SW) \qquad pq = (NW - SE)$$

where: pn is a position normal and pq is a position quadrature, and NE, NW, SE, and SW are data values provided by the four optical detectors.

11. The method of claim 10, wherein the second optical wireless unit calculates individual measured positional data using data from its optical detectors using the basis, the coefficients are calculated using the following equations:

$$
\begin{aligned}
g_{x2} &= g'_{11}\,DET \\
g_{y2} &= -g'_{01}\,DET \\
g_{x1} &= -g'_{10}\,DET \\
g_{y1} &= g'_{00}\,DET \\
g_{x0} &= \left(g'_{10}\,g'_{21} - g'_{11}\,g'_{20}\right)DET \\
g_{y0} &= \left(g'_{01}\,g'_{20} - g'_{00}\,g'_{21}\right)DET
\end{aligned}
$$

where: $DET = \dfrac{1}{g'_{00}\,g'_{11} - g'_{01}\,g'_{10}}$, the g' terms are elements of a G'inv matrix,

G'inv is defined as $G'inv = \left(XY'^{T} \cdot XY'\right)^{-1} XY'^{T}\,\mathrm{Pr}$, XY' is a matrix of reference

positions and is defined as $XY' = \begin{bmatrix} x_n & y_n & 1 \\ \vdots & \vdots & \vdots \\ x_N & y_N & 1 \end{bmatrix}$, where x_n and y_n are individual

reference positions, XY'^{T} is the transpose of the XY' matrix, $(XY'^{T}\,XY')^{-1}$ is the inverse of the $(XY'^{T}\,XY')$ matrix, and Pr is a matrix of measured positional data and is defined

as $\mathrm{Pr} = \begin{bmatrix} pn_n & pq_n & 1 \\ \vdots & \vdots & \vdots \\ pn_N & pq_N & 1 \end{bmatrix}$, pn_n and pq_n are individual measured positional data.

12. The method of claim 11, wherein the transforming step uses the following linear equations:

$$x_{cmd} = g_{x2}(pn_{sense}) + g_{x1}(pq_{sense}) + g_{x0}$$
$$y_{cmd} = g_{y2}(pn_{sense}) + g_{y1}(pq_{sense}) + g_{y0}$$

where: x_{cmd} and y_{cmd} are x and y values corresponding to measured position of the light beam to be transmitted back to the first optical wireless unit, pn_{sense} and pq_{sense} are the basis values calculated from data provided by the optical detectors of the second optical wireless unit, and the g terms are the coefficients

13. The method of claim 9, wherein the prespecified pattern is a spiral pattern with a specified number of revolutions.

14. The method of claim 13, wherein there is a plurality of reference positions, the first calculating step comprising:

generating measured positional data based upon data produced by the optical detectors;

repeating the generating step for one complete revolution of the spiral pattern; and

calculating a set of discrete Fourier transform (DFT) coefficients based on the measured positional data from the complete revolution.

15. The method of claim 14, wherein the DFT coefficients are calculated using the formulae:

$$g_{nc} = \frac{1}{N \cdot rev} \sum_{n=1}^{N \cdot rev} pn_n \cos\left(\frac{2\pi}{N} n\right) \qquad g_{qc} = \frac{1}{N \cdot rev} \sum_{n=1}^{N \cdot rev} pq_n \cos\left(\frac{2\pi}{N} n\right)$$

$$g_{ns} = \frac{1}{N \cdot rev} \sum_{n=1}^{N \cdot rev} pn_n \sin\left(\frac{2\pi}{N} n\right) \qquad g_{qs} = \frac{1}{N \cdot rev} \sum_{n=1}^{N \cdot rev} pq_n \sin\left(\frac{2\pi}{N} n\right)$$

$$g_{ndc} = \frac{1}{N \cdot rev} \sum_{n=1}^{N \cdot rev} pn_n \qquad g_{qdc} = \frac{1}{N \cdot rev} \sum_{n=1}^{N \cdot rev} pq_n$$

where: N is a specified number of measured positional data values per revolution, pn_n and pq_n are individual measured positional data after application of the basis.

16. The method of claim 14, wherein the method further comprising the step of calculating a quantity metric for the revolution after calculating the DFT coefficients.

17. The method of claim 16, wherein the quantity metric is expressed as

$maxsignal = g_{nc}^2 + g_{ns}^2 + g_{qc}^2 + g_{qs}^2$.

18. The method of claim 16, wherein the first calculating step is repeated for all revolutions of the spiral pattern, the method further comprising the step of saving the DFT coefficients from the revolution with the maximum quantity metric after calculating the quantity metric after the first calculating step.

19. The method of claim 18, wherein the gain coefficients are calculated using the following equations:

$$g_{x2} = +g_{qs} \cdot DET$$
$$g_{x1} = -g_{ns} \cdot DET$$
$$g_{x0} = \left(+g_{ns}g_{qdc} - g_{ndc}g_{qs}\right) \cdot DET$$
$$g_{y2} = -g_{qc} \cdot DET$$
$$g_{y1} = +g_{nc} \cdot DET$$
$$g_{y0} = \left(-g_{nc}g_{qdc} + g_{ndc}g_{qc}\right) \cdot DET$$

where: $DET = \dfrac{amplitude\ of\ rev\ chosen}{g_{nc}g_{qs} - g_{ns}g_{qc}}$, and the g_{nc}, g_{qc}, g_{ns}, g_{qs}, g_{ndc}, g_{qdc} are the DFT coefficients for the revolution with the maximum quantity metric.

20. The method of claim 13, wherein the transforming step uses the following linear equations:

$$x_{cmd} = g_{x2}\left(pn_{sense}\right) + g_{x1}\left(pq_{sense}\right) + g_{x0}$$
$$y_{cmd} = g_{y2}\left(pn_{sense}\right) + g_{y1}\left(pq_{sense}\right) + g_{y0}$$

where: x_{cmd} and y_{cmd} are x and y values corresponding to measured position of the light beam after compensation by the set of gain coefficients, pn_{sense} and pq_{sense} are the basis values calculated from data provided by the optical detectors of the second optical wireless unit, and the g terms are the gain coefficients.

21. A method for providing a common coordinate basis between two optical wireless units wherein information is transmitted between the optical wireless units via light beams, the method comprising:

at the first optical wireless unit:

moving the light beam in a first prespecified pattern;

receiving detector range data from the second optical wireless unit; and

moving the light beam in a second prespecified pattern;

at the second optical wireless unit:

determining detector range;

transmitting the detector range;

determining reference positions; and

generating a table of detector readings.

22. The method of claim 21, wherein the first prespecified pattern is a spiral pattern with a specified number of revolutions, first determining step comprising:

calculating a signal strength metric for each revolution;

maintaining a maximum signal strength;

comparing the signal strength metric with a threshold;

setting a radius of dynamic range if the signal strength metric is less than the threshold; and

transmitting the radius to the first optical wireless unit.

23. The method of claim 22, wherein the second optical wireless unit senses the light beam with its optical detectors a plurality of times per revolution of the light beam, the signal strength metric is expressed as:

$$signalStrength = \sum_{\substack{positional \\ data}} \left(NE^2 + SE^2 + SW^2 + NW^2 \right)$$

where: NE, SE, SW, and NW are data provided by the optical detectors and the summation is over all measured positional data points in a single revolution.

24. The method of claim 22, wherein the threshold is a small fraction of the maximum signal strength.

25. The method of claim 24, wherein the threshold is 12.5 percent of the maximum signal strength.

26. The method of claim 22, wherein the radius of dynamic range is the revolution whose signal strength is less than the threshold.

27. The method of claim 22, wherein the radius of dynamic range is the final revolution of the spiral if the signal strength of all the revolutions are greater than the threshold.

28. The method of claim 21, wherein the second prespecified pattern is pattern is scaled according to the received detector range data.

29. The method of claim 21, wherein the light beam pauses at each reference position as it follows the second prespecified pattern, the generating step comprising:

polling the optical detectors for data as the light beam pauses; and

saving the polled data.

30. The method of claim 29, wherein the second optical wireless unit polls the optical detectors for data a plurality of times as the light beam pauses and computes an average of the data.

31. The method of claim 29, wherein the generating step further comprising:

linearizing the data in the table; and

creating a second table with the linearized data.

32. The method of claim 21, wherein the method further comprising:

selecting a position from the table based on an optical detector reading; and

transmitting the position to the first optical wireless unit after generating the table of optical detector readings.

33. The method of claim 32, wherein the selecting step comprising:

polling the optical detectors for an optical detector reading;

generating a set of table indices; and

selecting a position using the set of table indices.

34. The method of claim 33, wherein the optical detector reading is determined from data provided by the plurality of optical detectors and is expressed as:

$$remote_x = NE + SE - SW - NW$$
$$remote_y = NE - SE - SW + NW$$

where: $remote_x$ and $remote_y$ are the optical detector readings, and NE, SE, SW, and NW are data from the optical detectors.

35. The method of claim 34, wherein the set of table indices are generated from the optical detector reading and is expressed as:

$$tentry_x = trunc(s_{x1} remote_x + remote_{x\min})$$
$$tentry_y = trunc(s_{y1} remote_y + remote_{y\min})$$

where: $s_{x1} = \frac{NumTableEntries}{remote_{x\max} + remote_{x\min}}$ $\quad s_{y1} = \frac{NumTableEntries}{remote_{y\max} + remote_{y\min}}$,

NumTableEntries is a number of entries in the table, $remote_{xmax}$, $remote_{xmin}$, $remote_{ymax}$, and $remote_{ymin}$ are maximum and minimum values along columns and rows of the table, and the trunc() operator truncates a numerical value to a specified number of decimal places.

36. The method of claim 35, wherein the position is stored in the table and is selected via the expressions:

$$
\begin{aligned}
x_{cmd} &= \left(table_x\left(tentry_x + 1\right) - table_x\left(tentry_x\right)\right)* \\
&\quad \left(remote_x S_{x1} - tentry_x\right) + table_x\left(tentry_x\right) \\
y_{cmd} &= \left(table_y\left(tentry_y + 1\right) - table_y\left(tentry_x\right)\right)* \\
&\quad \left(remote_y S_{y1} - tentry_y\right) + table_y\left(tentry_y\right)
\end{aligned}
$$

where: $table_x()$ and $table_y()$ are functions returning x and y entries from the table.

37. A method for maintaining an aligned light beam in an optical wireless network comprising:

at a source optical wireless unit:

receiving positional data from a destination optical wireless unit; and

adjusting the position of the light beam if needed;

at the destination optical wireless unit:

polling a set of optical detectors for positional data; and

transmitting the positional data to the source optical wireless unit.

38. The method of claim 37, wherein the method executes at a prespecified regularity.

39. The method of claim 37, wherein the method further comprises the step of transforming the positional data using a set of coefficients after polling the set of optical detectors.

40. The method of claim 39, wherein the transmitting step comprises transmitting the transformed positional data to the source optical wireless unit.

41. The method of claim 39, wherein the set of coefficients is determined during a calibration procedure using a least squares estimation technique.

42. The method of claim 39, wherein the set of coefficients is determined during a calibration procedure using a discrete Fourier transform estimation technique.

43. The method of claim 39, wherein the set of coefficients is determined during a calibration procedure using a look-up table technique.

44. The method of claim 39, wherein the transforming step transforms the positional data from a coordinate basis of the destination optical wireless unit into a coordinate basis of the source optical wireless unit.

45. The method of claim 37, wherein the method further comprises the step of transforming the received positional data using a set of coefficients prior to adjusting the position of the light beam.

46. The method of claim 37, wherein the method executes during normal operation of the optical wireless network.

47. The method of claim 37, wherein the positional data is transmitted along side normal communications traffic.